

CLAIMS

What is claimed is:

- 1 1. A method for laser scribing a wafer comprising:
2 laser scribing a continuous line; and
3 laser ablating an area adjacent the laser scribed continuous line, the laser
4 ablations in the area adjacent the laser scribed continuous line being spaced from
5 one another.
- 1 2. The method for laser scribing a wafer of claim 1 wherein the laser
2 ablations in the area adjacent the laser scribed continuous line are non-overlapping.
- 1 3. The method for laser scribing a wafer of claim 1 wherein the laser scribed
2 line and the laser ablated area adjacent the laser scribed continuous line have a
3 width greater than the width of a diamond saw blade.
- 1 4. The method for laser scribing a wafer of claim 1 wherein the laser scribed
2 line and the laser ablated area adjacent the laser scribed continuous line have a
3 width greater than the width of a kerf from a diamond saw blade.
- 1 5. The method for laser scribing a wafer of claim 1 wherein laser scribing a
2 continuous line is done next to a die on a wafer and wherein laser ablating an area
3 adjacent the laser scribed continuous line is done more distant from the die of the
4 wafer.
- 1 6. The method for laser scribing a wafer of claim 1 wherein the laser
2 ablations in the area adjacent the laser scribed continuous line are spaced from one
3 another in a range of 1 to 100 microns.

1 7. The method for laser scribing a wafer of claim 1 wherein the laser
2 ablations in the area adjacent the laser scribed continuous line are spaced from one
3 another in a range of 1 to 20 microns.

1 8. A computer readable medium containing instructions for causing a
2 suitably programmed computer to execute the method of claim 1.

1 9. A method for singulating dies from a wafer comprising:
2 laser scribing a continuous line on each side of the die; and
3 laser ablating an area adjacent the laser scribed continuous line on each side
4 of the die, the laser ablations in the area adjacent the laser scribed continuous line on
5 each side of the die being spaced from one another; and
6 sawing the laser abated area adjacent the continuous line.

1 10. The method for singulating dies from a wafer of claim 9 wherein laser
2 scribing a continuous line produces a continuous line proximate a die on a wafer and
3 wherein laser ablating an area adjacent the laser scribed continuous line is at an area
4 more distant from the die of the wafer.

1 11. The method for singulating dies from a wafer of claim 9 wherein the
2 laser ablations in the area adjacent the laser scribed continuous line are non-
3 overlapping.

1 12. The method for singulating dies from a wafer of claim 9 wherein the
2 laser scribed line and the laser ablated area adjacent the laser scribed continuous line
3 occupy an area having a width greater than the width of a saw blade.

1 13. The method for singulating dies from a wafer of claim 9 wherein the
2 laser scribed line and the laser ablated area adjacent the laser scribed continuous line
3 have a width greater than the width of a kerf from a saw blade.

1 14. The method for singulating dies from a wafer of claim 9 wherein the
2 laser ablations in the area adjacent the laser scribed continuous line are spaced from
3 one another in a range of 2 to 10 microns.

1 15. A computer readable medium containing instructions for causing a
2 suitably programmed computer to execute the method of claim 9.

1 16. A method for laser scribing a wafer comprising:
2 laser scribing a first continuous line;
3 laser scribing a second continuous line spaced apart from the first continuous
4 line; and
5 laser scribing a third continuous line, the third continuous line positioned
6 between the first continuous line and the second continuous line.

1 17. The method for laser scribing a wafer of claim 16 wherein the first
2 continuous line, the second continuous line and the third continuous line overlap.

1 18. The method for laser scribing a wafer of claim 16 wherein the third
2 continuous line overlaps the second continuous line and the third continuous line.

1 19. The method for laser scribing a wafer of claim 16 wherein the first
2 continuous line, the second continuous line and the third continuous line are formed
3 from overlapping pulses from a laser.

1 20. The method for laser scribing a wafer of claim 16 wherein the first
2 continuous line, the second continuous line and the third continuous line overlap are
3 in an area having a width greater than the width of a saw blade.

1 21. The method for laser scribing a wafer of claim 16 wherein the first
2 continuous line, the second continuous line and the third continuous line overlap are
3 in an area having a width greater than the width of a kerf from a saw blade.

1 22. A computer readable medium containing instructions for causing a
2 suitably programmed computer to execute the method of claim 16.

1 23. A method for singulating dies from a wafer comprising:
2 laser scribing a first continuous line;
3 laser scribing a second continuous line spaced apart from the first continuous
4 line;
5 laser scribing a third continuous line, the third continuous line positioned
6 between the first continuous line and the second continuous line; and
7 passing a saw through the area of the first continuous line, the second
8 continuous line and the third continuous line to cut the wafer.

1 24. The method for singulating dies from a wafer of claim 24 wherein the
2 first continuous line, the second continuous line and the third continuous line
3 overlap.

1 25. The method for singulating dies from a wafer of claim 24 wherein the
2 third continuous line overlaps the second continuous line and the third continuous
3 line.

1 26. The method for singulating dies from a wafer of claim 24 wherein the
2 first continuous line, the second continuous line and the third continuous line are
3 formed from overlapping pulses from a laser.

1 27. The method for singulating dies from a wafer of claim 24 wherein
2 the first continuous line, the second continuous line and the third continuous line
3 overlap are in an area having a width greater than the width of a kerf from a saw
4 blade.

1 28. A computer readable medium containing instructions for causing a
2 suitably programmed computer to execute the method of claim 24.

1 29. An apparatus comprising:
2 a laser adapted to direct laser energy toward a wafer;
3 a saw
4 a microprocessor for controlling the direction of the laser energy and
5 controlling the movement of the saw;
6 a memory operatively coupled to the microprocessor; said memory including
7 an instruction set to cause a suitably programmed apparatus to
8 laser scribe a first continuous line on a wafer; and
9 laser scribe an area near the first continuous line but not contacting
10 the first continuous line.

1 30. The apparatus of claim 29 wherein the laser scribe of the area near the
2 first area includes laser scribing a second line near the first line and further
3 comprising laser scribing a third line overlapping the first continuous line and the
4 second line.

1 31. The apparatus of claim 29 wherein the laser scribe of the area near the
2 first area includes producing a plurality of spaced laser ablations in the area adjacent
3 the first continuous line.